

## POWER ELECTRONICS

<b>Course Code</b>	20EE3502	<b>Year</b>	III	<b>Semester(s)</b>	I
<b>Course Category</b>	Professional Core	<b>Branch</b>	EEE	<b>Course Type</b>	Theory
<b>Credits</b>	3	<b>L-T-P</b>	3-0-0	<b>Prerequisites</b>	1.Circuit Theory 2.Electronic Devices and Amplifier Circuits
<b>Continuous Internal Evaluation:</b>	30	<b>Semester End Evaluation:</b>	70	<b>Total Marks:</b>	100

<b>Course Outcomes</b>	
<b>Upon successful completion of the course, the student will be able to</b>	
CO1	<b>Understand</b> the basic operation of various power electronic devices and their characteristics, Various Power Converters, firing scheme, Snubber circuit, series and parallel connections of SCR. (L2)
CO2	<b>Apply</b> the basic knowledge to obtain the operation, waveforms and desired parameters of Two-Transistor analogy and characteristics of SCR, , Necessity of series and parallel connections of SCR, Rectifiers and Choppers.(L3)
CO3	<b>Apply</b> the basic knowledge to obtain the operation, waveforms and desired parameters of Snubber circuit ,Inverters and AC to AC converters. (L3)
CO4	<b>Analyze</b> the concepts of Two-Transistor analogy and characteristics of SCR, Necessity of series and parallel connections of SCR ,load voltage- current expressions for Rectifiers and Choppers (L4)
CO5	<b>Analyze</b> the concepts Snubber circuit ,load voltage-current expressions for Inverters and AC to AC converters. (L4)
CO6	<b>Submit a report</b> in Power Semiconductor Switches, Rectifiers, Choppers, Inverters and AC to AC converters.

<b>Contribution of Course Outcomes towards achievement of Program Outcomes &amp; Strength of correlations (3:High, 2: Medium, 1:Low)</b>														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3					1	1						2	2
CO3	3					1	1						2	2
CO4		2											2	2
CO5		3											2	2
CO6						3	3		3	3		3	2	2

<b>SYLLABUS</b>		
<b>Unit No.</b>	<b>Contents</b>	<b>Mapped CO</b>
I	<b>Power Semiconductor Switches:</b> Power Diode, Power MOSFET, Power IGBT, DIAC Principle of operation and characteristics. Principle of operation of SCR, static, dynamic	CO1 CO2 CO3

	characteristics, Two-Transistor analogy of SCR, Triggering methods of SCR, gate driver circuit with IGBT & MOSFET, Snubber Circuit, Necessity of series and parallel connections of SCR.	CO4 CO5 CO6
II	<b>AC –DC Converters(Rectifiers):</b> Phase angle control, single phase half wave and full wave(mid point) controlled rectifiers with R and RL load, half controlled ( symmetrical configuration) and fully controlled bridge rectifiers with R, RL loads - effect of source inductance. Three phase half and fully controlled bridge converters-with R and RL loads, Single phase dual converters.	CO1 CO2 CO4 CO6
III	<b>DC to AC Converters (Inverters):</b> Series Inverter and Parallel Inverter ,single phase full bridge inverters, comparison between VSI & CSI, three phase VSI (180 &120-degree conduction modes). Introduction to Multi level Inverters-Cascaded H Bridge inverter (principle of operation). Voltage control techniques for inverters: Pulse-width modulation techniques - single pulse, multi-pulse, sinusoidal pulse width modulation techniques( <b>descriptive treatment only</b> ).	CO1 CO3 CO5 CO6
IV	<b>DC to DC Converters (Choppers) –</b> Control strategies of chopper, Buck, Boost, Buck-boost choppers- Derivation of average load voltage and current expressions, Filter design( <b>derivation only</b> ), Four quadrant chopper ( <b>principal of operation</b> ).	CO1 CO2 CO4 CO6
V	<b>AC to AC converters (AC Voltage controllers and Cyclo-converters) :</b> Two SCR’s in anti parallel with R and RL loads, derivation of RMS load voltage, current and power factor. Cyclo converters – single phase mid-point and bridge type cyclo-converters with resistive and inductive load( <b>Principle of operation only</b> ).	CO1 CO3 CO5 CO6

### Learning Resources

#### Text Books

1. P.S.Bhimbra, ‘PowerElectronics’, Khanna Publications, 5<sup>th</sup> edition, 2018.
2. M.H. Rashid, ‘ Power Electronic Circuits Devices and Applications’, Pearson, 4<sup>th</sup> edition, 2017.

#### Reference Books

1. M.D.Singh and K.B.Kanchandani, ‘PowerElectronics’, McGraw Hill Publications, 2<sup>nd</sup> edition ,2017.
2. NedMohan, ToreM.Undeland, WilliamP.Robbins, ‘PowerElectronicsConvertersApplications and Design”, McGraw-Hill Education, 3<sup>rd</sup> edition, 2007.
3. P.C.Sen Power Electronics , Tata McGraw-Hill Publishing, 2<sup>nd</sup> edition ,2006.
4. Vedam Subramanyam , ‘Power Electronics-Devices Converter Applications’, , New Age International (P) Limited, 2<sup>nd</sup> edition ,2018.

#### Web Links

1. <https://nptel.ac.in/courses/108101038>
2. <https://nptel.ac.in/courses/108105066>